

## Applying the principles of experience-dependent neural plasticity: Analysis of a language therapy session

100 word abstract

Provision of language therapy to persons with aphasia is an intensive, dynamic process. Qualitative analyses of single sessions can serve as relevant data when monitoring progress in therapy, i.e. changes in performance over time. These analyses substantiate the application of the principles of experience-dependent neural plasticity and aid in specifying the parameters of ‘what makes a therapy’. In this study, analysis of a single session provided to a severely impaired person with Broca’s aphasia (♀, 36 years old) demonstrates that even within a single session performance improves and learning takes place and this improvement is maintained until the next session.

Providing language therapy to persons with aphasia (PWA) is an intensive and dynamic process. Qualitative analysis of single sessions can serve as data points when considering the evolution of changes in language performance over time. Assuming that the structure remains constant for the duration of the entire protocol, comparison of single sessions allows a therapist to monitor the progress in therapy and evaluate the patterns in the interactions between the PWA and the therapist.

In this presentation a single session provided to a PWA with severe Broca’s aphasia is analyzed with regard to the principles of experience-dependent neural plasticity and selected parameters put forward by Byng (1995) for characterizing what constitutes a language therapy. The main question to be addressed is: What can be learned from analysis of a single therapy session?

### *Methods*

#### *Participant*

PA is a 36 year old, female, with a Master’s degree in psychology, who prior to her brain damage had worked as a psychologist. During the process of giving birth to her first child, she suffered a massive hemorrhage (Hellp-Syndrome). At 18 MPO, PA was referred to our unit for language testing and therapy. Her initial severe language impairment diagnosed as global aphasia evolved into Broca’s aphasia consisting of one to two word utterances and moderate apraxia of speech. She completed a first intensive therapy protocol and after an interval of two months a second protocol was initiated.

Her comprehension is moderately to mildly impaired and has been improving steadily, whereas reading and writing are severely impaired.

#### *Procedure*

The language therapy protocol provided to PA encompasses 60 sessions 3 times a week. Each session has the same overall structure in which four ‘old’ items are repeated and four ‘new’ items are worked on intensively. Each session consists of the following steps: Recall and then repetition of the items from the last session (‘old’ items), work on the ‘new’ items for the first time (producing sentences (step three) and asking questions about the semantic roles and activities, i.e. sentence constituents (step four), auditory comprehension check, repetition of the new items, recall of the new items at the end of the session, and at the beginning of a new session recall of the items worked on in the previous session. The homework assignment is for PA to convey the content of the items worked on in the therapy session, whereby the caregiver wrote down the spontaneous productions recalled by PA. The steps allow for

repeated trials of orally producing and recalling sentences. The materials used were picture stimuli depicting basic everyday activities.

Each session is video- and audiotaped. The 13<sup>th</sup> session of the second protocol (24 MPO) is discussed in this presentation due to its recency, and because a new word was introduced.

The session was transcribed and the transcription served as the basis for analysis. The session lasted one hour and seventeen minutes with pauses. The following recall at the beginning of the 14<sup>th</sup> session lasted thirteen minutes. The focus of the therapy was to improve word-finding for nouns and verbs within the context of orally producing sentences. In total eight picture stimuli were worked on.

## *Results*

In Table 1 the distribution of total produced words including and excluding repetitions, verbs and nouns is given.

Insert Table 1

The article preceding the nouns was usually deleted in her spontaneous speech and the verb was predominantly produced in the infinite form. When repeating the sentences she was to produce the article and the finite form of the verb, however this behavior was not consistent. After a long pause PA would produce a correct single word, usually the verb or direct object of the target sentence. No correct complete sentences were produced spontaneously. In response to follow-up questions the missing constituents were produced by PA. For the majority of the items, the content of the depicted activity was ultimately produced.

In Table 2 an analysis of PA's performance is given with regard to the ultimate correct conveying of information for the items.

Insert Table 2

The cue predominantly used by the therapist was a direct question, which resulted in the most correct responses from PA. A semantic cue also resulted in numerous correct responses. Phonological prompts were also used, however these were not as successful.

A description of PA's performance is given with regard to the principles of experience-dependent neural plasticity in Table 3.

Insert Table 3

## *Discussion*

Analysis of a single session documents the abilities of PA – a severely impaired PWA – and demonstrates how she improves *even* within a single session and is able to maintain what has been achieved up to three days. From this single session it is not possible to deduce a systematic pattern of which grammatical categories are first produced. It varied from verb in the infinite form to noun (direct object) first. A comparison with other sessions is necessary. At the end of a session, PA was able to produce the content of the new items worked on. PA's articulation varied throughout the session, but tended to improve with the repetitions. The number of repetitions to achieve the performance was great and varied depending on the momentary word-finding and articulatory difficulties. Of the principles of experience-dependent neural plasticity, the first six are most relevant and substantiated by the therapy provided to PA.

PA's limitation in spontaneously producing and repeating mainly two words in succession gives her oral production the appearance of being more severely impaired. In the majority of the cases she was able to spontaneously produce the relevant content of the sentences upon direct questioning even if it took up to thirty seconds to do so. New words were also learned within a session and recalled at the beginning of the next session (e.g., 'the children').

In summary, documenting single therapy sessions provides valuable information for monitoring language performance and changes over time. The therapy provided to PA – which follows the principles of experience-dependent neural plasticity – demonstrates the relevance of these principles and of making language therapy more explicit.

Byng, S. (1995). What is Aphasia Therapy? In C. Code, & D. Müller (Eds.), *The Treatment of Aphasia From Theory to Practice*. San Diego: Singular, pp. 3-17.

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